

2016 Fellow Reports

The reports of Tau Beta Pi's 82nd Fellowship Program and the 2015-16 Fellows are presented here. The reports constitute the only specific obligation to the Association after being appointed by the Fellowship Board. Their reports were written in April, and the verb tenses may sound wrong when read later.

The 30 Fellows, received a cash stipend of \$10,000 for a year of graduate study, totaling \$250,000. Each of the recipients expresses appreciation to advisors and teachers, to family and helpful friends, and to the Association, donors, and the Fellowship Board for the honor of being named a Tau Beta Pi Fellow.



Anthony I. Ambrosio-Meir

Anthony I. Ambrosio-Meir, CA E '15
Stark Fellow No. 38

During the past year as a TBPI Fellow, I began working on my master's degree in structural engineering at Stanford University, devoting my year towards coursework. My classes focused primarily on advanced structural analysis methods and earthquake engineering in order to better understand the design of structures in highly seismic areas. My classes have been both fascinating and challenging and I look forward to continuing my studies in the fall with an in depth look at performance based earthquake engineering.

The summer between completing undergrad at UCLA and starting graduate school at Stanford, I worked as an intern for Catena Consulting Engineers in Portland, OR. There I was able to gain real-world experience on a variety of structural engineering projects. This coming summer, I am looking forward to interning at Degenkolb Engineers in San Francisco, CA, where I will be able to continue gaining experience and be able to apply what I have learned in graduate school.

I am thankful for Tau Beta Pi's support towards my master's degree and am honored to have been selected as a TBPI Fellow. This opportunity helped me to further my graduate studies and I look forward to sharing what I have learned with the engineering community.

Gregory H. Canal, NC F '15
Fife Fellow No. 193

This past year, I started my Ph.D. in electrical and computer engineering at the Georgia Institute of Technology. My interests include digital signal processing, machine learning, and information theory, and I focused on these subjects in my first year of coursework and activities. During my first semester, I was a teaching assistant in an undergraduate digital signal processing course, grading assignments, and running weekly lab sessions. I also began research with Dr. Chris Rozell, a professor in the Center for Signal and Information Processing.

Under Dr. Rozell's guidance as my Ph.D. advisor, I have begun research in the area of closed-loop human-computer systems. This topic utilizes tools from information theory to model humans as information sources and design interfaces that use human knowledge in an optimal way to interact with computers, systems, and data sets.

I also worked on a specific application of closed-loop human-computer systems involving brain-computer interfacing with robotics. The goal was to design a system where a user can use his brain activity to modulate electrical potentials on his scalp, which are measured by an electroencephalogram and used to give control signals to robotic swarms. The task was chosen since it is inherently noisy and difficult, yet the presence of visual feedback from the robots along with results from feedback information theory led to the design of a successful control algorithm.

My hope is to study such systems with feedback on an abstract level and make contributions to the field of interactive machine learning, where the focus is placed on how human knowledge can be used to impose constraints and modify the processing of data sets. While I am still in the early stages of my Ph.D., my tentative plans after graduating involve working in an industry or national research lab.



Gregory H. Canal



Steven R. Delacruz

Steven R. Delacruz, NV A '15
Sigma Tau Fellow No. 42

I am pursuing a Ph.D. in chemical engineering at the University of California, Berkeley. My first year has been incredibly enriching and productive. I've completed my program's core courses, which have reinforced my understanding of the fundamentals of my discipline, as well as its rigorous, oral preliminary examinations.

I served as a graduate student instructor for an introductory undergraduate chemical engineering course. In this capacity, I was able to independently lead course discussions, facilitate student understanding over a broad range of chemical engineering basics, and provide critical feedback and assistance for the students' design project.

Additionally, I had the opportunity to join the applied materials and surface science laboratory of professor Roya Maboudian, Ph.D. My project examines the application of modern nanofabrication techniques to improve the viability of thermal energy to electrical energy conversion technologies. This project has granted me the ability to conduct interdisciplinary research with facets of chemical, electrical, and materials engineering.

I have focused on furthering my understanding of the physical principles and past work of my research, familiarizing myself with both the theory and equipment for nanofabrication, and fabricating and analyzing preliminary materials for energy conversion. After completing my graduate studies, I hope to continue researching materials for energy-related applications, preferably with a national laboratory or in industry.

Kimberly T. Dinh, WI A '15
Fife Fellow No. 194

Since graduating from the University of Wisconsin-Madison, I have begun my Ph.D. program at MIT in chemical engineering. My first semester, the focus was on core courses: numerical methods, advanced transport phenomena, and advanced thermodynamics, while also meeting with professors and older graduate students to choose an advisor. Eventually, I chose Professor Yuriy Román-Leshkov whose research focuses on heterogeneous catalysis. At the end of the semester, my cohort and I passed our qualifying exam.

In the second semester, I have taken the last of the required courses, advanced kinetics and systems engineering. I have also started my research on the oxidation of methane to methanol. Primarily, I have learned the required zeolite synthesis techniques and will move into learning the techniques used to study the reactivity and kinetics of methane oxidation.

During the summer, I will continue to work on my project and prepare for my thesis proposal in the fall. The following spring, I will participate in the MIT Practice School program, an intensive four month internship, working with other practice school participants. After completing the program, I will earn a master's in chemical engineering practice and will then return to my Ph.D. studies.

I am very thankful for my selection as a TBPI Fellow and all the opportunities provided to me by Tau Beta Pi.



Kimberly T. Dinh



Sylvia Domanico

Sylvia Domanico, MI Γ '15
Fife Fellow No. 195

During this past year as a TBPI Fellow, I completed my master's degree in nuclear engineering and radiological sciences at the University of Michigan (U of M). I worked in the thermal-hydraulics group in my department, and did research projects on 1D/3D code coupling for improved thermal hydraulic safety analysis and on gamma tomography reconstruction of two phase flow in a fuel assembly, an NRC project. These projects are important, especially for the increased safety of nuclear reactors.

In the fall, I served as president of the MI Gamma Chapter, and had a lot of fun leading our officer corps through a successful semester. Being president was an eye-opening experience, and one of my favorites. As president, I was invited to join the diversity, equity, and inclusion initiatives at the U of M. I served as a student representative on the undergraduate committee. I, along with two other student representatives and several faculty members, helped draft a 5-year plan to improve diversity, equity, and inclusion within the College of Engineering. I hope to see future improvement in this area at U of M and within the College of Engineering. I also look forward to watching our chapter get more involved with a lot of the important things going on within the college and the community.

This past year as a master's student has been my favorite yet at U of M and was heavily helped by the TBPI fellowship. I'm honored and humbled to have been a recipient of this award. In May, I will be going to Europe for a post-graduation trip and in the fall I should start working in the nuclear industry.

Morgan B. Elliott, MO E '15
Fife Fellow No. 196

This year, I began the biomedical engineering doctoral program at Johns Hopkins University (JHU). My focus is on tissue engineering and I have completed the medical school anatomy and immunology courses, as well as several engineering courses. To encourage other students to be passionate about their coursework and research, I became the graduate student advisor of the Alpha Eta Mu Beta Biomedical Engineering Honor Society chapter at JHU.

I have also begun working on a vascular engineering project in Dr. Sharon Gerecht's lab. To become more familiar with the field, I wrote a review with Dr. Gerecht entitled "Three-dimensional culture of small-diameter vascular grafts," which was published by the *Journal of Materials Chemistry B*. The review concentrated on biomaterial substrates, cellular choices, and biomechanical stimulation used in previous efforts to engineer three dimensional small-diameter vascular grafts.

After completing the review, I assisted in writing a grant to fund my vascular engineering project that will focus on aiding those who require coronary artery bypass grafts. There is a pressing clinical need to develop small-diameter tissue engineered vascular grafts (TEVG) for patients with cardiovascular disease, an elusive goal due to post-implantation challenges like thrombus formation and aneurysmal failure. My goal is to create a stable, functional, and mature TEVG to replace the autologous tissue typically used in clinical procedures.

I am also excited to continue my work as a NSF graduate research fellow next year. After completing my Ph.D., I intend to move into industry. While working in research and development, I hope to aid a patient population by developing a product with significant clinical impact. I sincerely appreciate the support of Tau Beta Pi in pursuing my graduate degree in biomedical engineering with a focus on cell and tissue engineering.



Morgan B. Elliott



Matthew C. Fahrbach

Matthew C. Fahrbach, KY A '15
Fife Fellow No. 1974

I am pursuing a Ph.D. in algorithms, combinatorics, and optimization at the Georgia Institute of Technology through the college of computing. In my first year as a TBPI Fellow, I researched random walk algorithms for problems in mathematics and statistical physics with Professor Dana Randall.

Specifically, I used Markov chain Monte Carlo algorithms and Boltzmann sampling methods to design algorithms that generate complex combinatorial structures uniformly at random. The work includes analyzing the mixing time of Markov chains, designing provably faster algorithms, and identifying problems that can be solved with these algorithmic and combinatorial tools.

In addition to research, I completed core coursework, participated in workshops at the Simons Institute for the Theory of Computing, and helped coach the Georgia Tech ACM International Collegiate Programming Contest teams.

This summer, I will work as a software engineer at Google in Mountain View, CA, where I will use machine learning to improve the efficiency of Google's web crawlers.

In the fall, I will return to Georgia Tech with a NSF Graduate Research Fellowship and continue research in randomized algorithms and combinatorial sampling.

I am grateful for Tau Beta Pi's support and encouragement, because my first year at Georgia Tech has been exceptionally exciting and productive.

Thomas P. Foulkes, IN B '15
Forge Fellow No. 4

I am grateful to TBPI and the Charles O. Forge family for their generous support of my first year of graduate studies in electrical engineering at the University of Illinois at Urbana-Champaign. I have had the privilege to work with Dr. Robert Pilawa on a rich variety of research obstacles facing the development of higher power density converters for solar photovoltaics, electric vehicles, and more-electric aircraft.

As a finalist in the IEEE/Google Little Box Challenge, I helped construct a two-kilowatt, single-phase, grid-tied bench-scale prototype of the first 7-level flying capacitor inverter that demonstrated how replacing an inverter's conventional inductive energy conversion element with advanced ceramic capacitors can greatly increase the overall power density. I gained valuable design intuition from analyzing the sources of electromagnetic interference in this compact system and developing mitigation schemes to meet federal emission requirements.

I have also worked on the design of and development of control algorithms for a high specific power density inverter to drive a low inductance machine for NASA's fixed wing project. As part of the new Power Optimization of Electro-Thermal Systems NSF Engineering Research Center, I have been investigating advanced cooling and thermally aware control techniques. These collaborative initiatives have already resulted in the first observation of jumping droplet phase change cooling of power electronics.

I have had the opportunity to share these contributions with the engineering community through several publications and presentations at both national and international conferences. I will continue to investigate these challenges facing electrification and energy security as a National Science Foundation Graduate Research Fellow.



Thomas P. Foulkes



Neil R. Gandhi

Neil R. Gandhi, CA Ψ '14
Fife Fellow No. 198

I am finishing my first year of the M.D. program at Stanford University's School of Medicine. This year, I learned basic science, including anatomy, neurobiology, and the cardiovascular system as well as clinical skills such as patient history taking, physical exam, and case studies.

I also learned how to develop new engineering technology based on strong clinical needs. I elected to pursue a bioengineering scholarly concentration with an emphasis in biodesign, where I immersed myself with a team into MedTech entrepreneurship, prototyping, FDA regulation, IP landscape, and business models.

I recently started working with a diverse team to monitor the progression of peripheral arterial disease using Apple ResearchKit. The project centers on understanding biomechanical functionality of patients with peripheral arterial disease and how interventional and surgical medical device treatments can be optimized based on each patient's individual mobility. Working on this project is an incredible interface between patient-centered design, mobile technology, and data analytics.

Next year, I will focus on second-year medical curriculum along with mobile health projects. I will also spend some time in Japan learning about the healthcare system, policy, and education alongside Japanese medical students. My goal is to innovate within medicine with a broad perspective of engineering, business, and medicine. The TBI Fellowship has provided great support for my graduate education and I am grateful to be a part of such an extraordinary student cohort.

Tyler I. Gerhardson, MA I '15
Fife Fellow No. 199

My first year in the biomedical engineering Ph.D. program at the University of Michigan has challenged and rewarded me in ways I never could have imagined. I joined the Histotripsy Lab at U of M because I had a strong interest in the versatility of acoustics applied to medical problems.

I started my research optimizing histotripsy parameters for transcranial treatment of large blood clots in vitro. The objectives were to model blood clots characteristic of hemorrhagic stroke and to use histotripsy to treat them at a faster rate than the current clinical procedures. The initial results of this study were presented at UM's engineering symposium and an IEEE International Ultrasound Symposium meeting.

My year as a TBI Fellow has been spent researching and balancing a full course load. Two courses in medical imaging have given me an in-depth perspective on the ultrasound image guidance used in my lab. A histology course has provided me insight on analyzing lesions produced using histotripsy. I have also participated in a research project with a postdoc that focused on understanding the effects of transducer design on histotripsy treatment efficacy.

In the upcoming year, I will build upon the research focused on transcranial histotripsy clot treatment by designing and fabricating a catheter integrated miniature acoustic hydrophone that can be used to correct for the ultrasound distortion induced by the skull. My goal is to have two papers published within the upcoming year.

I am sincerely grateful for my time as a TBI Fellow. I am inspired by the support and generosity of the organization and plan to pay-it-forward through my career as a researcher.



Tyler I. Gerhardson



Albert R. Gnadt

Albert R. Gnadt, WI A '15
Dodson Fellow No. 2

After graduating from the University of Wisconsin-Madison with a bachelor's degree in mechanical engineering, I began my first year of graduate study at the Massachusetts Institute of Technology. As an NSF graduate research fellow in the gas turbine laboratory, I am seeking a master's degree in aerospace engineering.

Coursework has greatly expanded my knowledge of gas turbine engines, turbomachinery, fluid dynamics, and internal flows. These topics are directly related to my research on the characterization and mitigation of blade waviness effects on compressor performance. Furthermore, since the focus of my future experimental research hinges on wind tunnel experiments, much self-education of wind tunnel component design has been completed.

This academic year, I carried out an engine cycle based study of the impact of fan blade surface waviness on fuel burn. This analysis provided estimates for potential fuel savings that could be achieved through modified compressor blade waviness, which would positively impact airlines, aircraft manufacturers, and society as a whole.

In addition, I've designed a variety of wind tunnel configurations for anticipated experiments. These designs include a variety of test conditions (Mach and Reynolds numbers) and tunnel types (open and closed loop). Using MISES, an interactive boundary layer solver, 2D calculations have been acquired that predict the sensitivity of a deformable top wall in the wind tunnel test section.

The experimental setup will be completed and blade experiments will be conducted in a renovated laboratory within the next year. I plan to graduate in 2017 and enter the gas turbine or compressor industry. I am very grateful for Tau Beta Pi's generous support of my graduate studies.



Jonathan E. Inglett

Jonathan E. Inglett, MD Γ '15
Fife Fellow No. 200

Following graduation from the United States Naval Academy with a bachelor's in systems engineering, I began my studies at the University of Pennsylvania to pursue a master's degree in robotics. This year, my time has been mostly focused on completing the required coursework. As the field of robotics is incredibly multi-disciplinary, it has been exciting to have access to such a wide range of courses, particularly in the fields of electric engineering, mechanical engineering and computer science.

In the fall, my courses were centered on the design of mechatronic systems. Specifically, control systems and their interweaving with mechanical design, analog and digital circuitry and signal processing. This spring, I have been focused on the mathematical underpinnings of extracting useful information from cameras onboard robots used for navigation and 3D environment reconstruction.

This summer, I will complete the final course required for my master's degree and will commence training as a Marine Corps officer in Quantico, VA.

My fellowship year has been both incredibly challenging and rewarding and I am extremely grateful for the opportunity to pursue graduate education and for Tau Beta Pi's support. This year has provided me with many incredible experiences and invaluable knowledge and skills which have developed me academically and professionally, and will serve me well as I begin my career in the Marine Corps and beyond.



Allison M. Kindig

Allison M. Kindig, IA B '15
Tau Beta Pi Fellow No. 809

After graduating from the University of Iowa, I completed a summer internship with a grassroots research and advocacy organization in India. My research identified potential indicators of human and social capital that link to economic consequences. This work was conducted as part of a long-term multidisciplinary study aimed to bring about change in the policy discourse on sustainable development, with specific focus to improve the practice of development in southern India.

In the fall of 2015, I began my graduate studies at the University of Cambridge, where I am currently pursuing a master's degree in engineering for sustainable development. My current research focuses on improving network reliability in sustainable food systems using system dynamics modelling. The aim of the project is to quantify the scope for multi-functional land use in order to improve food security and simultaneously prevent anticipated land shortages, mitigate climate change, increase resilience to extreme weather events, and restore biodiversity in the UK.

In addition to my studies, I am a member of the Cambridge Univ. Triathlon Club, and recently cofounded a social enterprise partnership called Change for Stamina. Our group aims to teach kids about sustainability through sports and interactive team challenges. Upon completion of my master's program, I hope to be part of multidisciplinary teams seeking to achieve food security and design sustainable communities of the future. I look forward to the challenge, and am forever grateful for the support I received from the TBPI Fellowship that helped make this endeavor possible.

Ryan R. Mahutga, SD B '15
Williams Fellow No. 36

This past year as a TBPI Fellow has been immensely rewarding. I began my studies in biomedical engineering seeking a Ph.D. from the University of Minnesota-Twin Cities, after graduating with a bachelor's degree in mechanical engineering from South Dakota State University. The transition from mechanical engineering to biomedical engineering has been challenging, and has involved viewing engineering systems in a completely new way.

In my new studies, I found a passion for physiology, mechanics, and mathematics that I never knew I had. I have taken many continuum mechanics, biomechanics, and tissue mechanics courses, and joined the barocas research group. This group is at the intersection of biology, mathematics, mechanics, and computer simulation. Since joining this group, I've taken on a project looking at mouse aortic mechanics in diseased states. I am particularly excited to study aortic mechanics in mice afflicted with Marfan Syndrome – a genetic disorder effecting connective tissue – because it is something I live with.

Since entering graduate school, I have also gotten to pursue my passion in teaching. I currently volunteer as a school coordinator with a program called Teaching SMART that performs STEM outreach in local middle schools by leading after-school science lessons. I have found this program very enlightening, and hope to advance my role in the organization. I also lead groups of interested high school and prospective graduate students on tours of our lab facilities where they learn about the type of research we do and why it is important. Each of these activities has reassured me that education is the field I want to be in.

I am incredibly thankful to TBPI for awarding me this fellowship that has helped me find and pursue my passions in teaching and research in biomedical engineering.



Ryan R. Mahutga



Daniel A. Martin III

Daniel A. Martin III, AZ A '15
Fife Fellow No. 202

This past year, I began my Ph.D. in electrical engineering at the California Institute of Technology, where I was able to start my research with the biophotonics group, led by Dr. Changhuei Yang. His research primarily focuses on improving the technology behind medical microscopy.

Throughout the year, my research has focused on using computational techniques to reduce the size of microscopy systems. Using a method called Fourier ptychography, my partners and I created a compact 1:1 imaging system with a wide field of view and fluorescent imaging capabilities. This system is small enough to fit inside an incubator and can image a standard six well culturing plate. This allows biologists to observe cells in a natural environment on a continual basis. Additionally, I worked on a lensless on-chip microscope sensor. Its small size makes it ideal for microfluidic applications. We demonstrated this fact by trapping labeled waterborne parasites in microfluidic channels and imaging them.

I have taken courses to advance my knowledge in optics, to finish my degree requirements, and have passed my qualifying exams. My favorite course was a design class on biological devices where I built a pulse oximeter and a real-time PCR. I am looking forward to teaching that class next spring. I attended the SPIE Photonics West conference to see the latest in photonics-related research. I plan to attend another conference in imaging sciences over the summer to present a poster on my research.

My goals next year are to have my first publication, define, and possibly begin on the research that I will use for my thesis. After completing my degree, I hope to continue research on medical imaging technology in industry. These achievements would not have been possible without the support from Tau Beta Pi.



Jelena Notaros

Jelena Notaros, CO B '15
Fife Fellow No. 203

During my time as a TBPI Fellow, I began my graduate work at MIT in integrated photonics as a Presidential Fellow and NSF Graduate Research Fellow. I started the year in the quantum photonics laboratory (QPL) and then switched to the photonic microsystems group (PMG).

Analogous to the enigma machines built during WWII, recent work in quantum communications has turned to the realization of a quantum enigma machine (QEM) that securely encrypts, sends, and decrypts data. During my time in the QPL, I experimentally validated the first silicon photonics system capable of enabling a QEM. I will present my findings at the *2016 Conference on Lasers and Electro-Optics* and am preparing a manuscript for journal submission.

Optical phased arrays, which emit and steer light using nanoscale silicon devices, offer possibilities for applications in areas including holography, biomedical sciences, and ion trapping. Since switching to the PMG, I have developed the theory, design, and layout for the first focusing on-chip phased arrays. The arrays, fabricated in a standard CMOS process, will manipulate the phase fed into each on-chip antenna to enable focusing of radiated light into micron-scale spots.

Additionally, I presented my summer research at the *2016 Optical Fiber Communication Conference* and was co-author on a second paper. I also held the visit day chair and coffee hour chair positions in MIT's EECS graduate student association. By organizing weekly coffee socials (attended by ~70 students) and the department's incoming student visit day, I hope to have a broader impact on the dept. and MIT's student culture.

I am very grateful for the generous support of TBPI which has enabled the impactful, life-changing experiences I have had so far at MIT.



Jacqueline C. Plyler

Jacqueline C. Plyler, SC B '15
Fife Fellow No. 204

Following my graduation from the Univ. of South Carolina, I started my graduate career at the veterinary medical scientist training program at the Univ. of Georgia. I am completing my first year in the Ph.D. portion of the dual-degree Ph.D. / DVM program. My Ph.D. is in veterinary and biomedical sciences within the infectious disease department.

I have begun my research under Dr. Ted Ross in the center for vaccine and immunology at UGA. My research project is focused on highly pathogenic avian influenza (H5N1) vaccines. Using our computationally optimized broadly reactive antigen (COBRA) technique, we have developed several universal H5N1 vaccine candidates. However, the precise mechanisms by how these lab-manufactured antigens elicit antibody responses is unknown.

Through utilizing biomedical techniques and genetically engineering these antigens and virus-like particles, I hope to answer the question of defining the repertoire of antibodies elicited by our universal vaccines and improve our candidates for use in the poultry industry. Furthermore, through defining the diversity and variety of antibody repertoires following vaccination of our H5N1 vaccine candidates, these protective antibodies could be grown and utilized in treatments of diseases with high mortality rates.

I am striving to incorporate both the clinical side of veterinary medicine and the research knowledge of biomedical sciences and engineering techniques to achieve a balanced and grander perspective on how to better prevent zoonotic infectious diseases.

Angela B. Rodriguez, FL Δ '15
Fife Fellow No. 205

As a TBPI Fellow, I had the opportunity to conduct field research, strengthen my presentation skills through oral and poster presentations, and complete 21 credit hours of formal coursework at the University of Central Florida. My master's research is focused on controlling disinfection byproduct (DBP) formation in drinking water distribution systems to decrease the public's involuntary exposure to these suspected carcinogenic compounds.

This past academic year, I was involved in two DBP control projects: (1) DBP control through spray aeration in Jackson, GA, and (2) DBP control through GAC and spray aeration in Maui, HI. The outcomes of both field studies provided local leaders with critical information that was used to make decisions that improved water quality with minimal financial capital impact.

In the fall of 2015, I presented a poster at the Florida Section AWWA Fall Conference poster competition on the use of ozone as a method to reduce DBP precursors in water to reduce DBP formation. In the spring of 2016, I presented a lecture on statistical methods for the prediction of future water demand based on population growth to my research advisor's undergraduate water treatment, plant design course. Additionally, I gave oral presentations to: (1) the County of Maui Dept. of Water Supply regarding ongoing DBP control studies, and (2) the executives of Pulama Lanai regarding the results of a desk-top study on sustainable concentrate management.

I would like to sincerely thank Tau Beta Pi for their financial support as it allowed me to achieve far greater heights than I expected during my first year of graduate school. In the spring of 2017, I will enter UCF's environmental engineering doctoral program with financial assistance from the National Science Foundation as a NSF Fellow.



Angela B. Rodriguez



Kenneth W. Smith Jr.

Kenneth W. Smith Jr., OH K '15
Arm Fellow No. 7

After graduating from the University of Akron, I spent the summer at NASA Kennedy Space Center in Cape Canaveral, FL. I performed a "Spacecraft Dynamic Model Verification" study that determined the gaps and deficiencies of a modal impact test and a vibration test when extracting modal parameters. I created a finite element model (FEM), performed the testing, then correlated and updated the FEM.

In the Fall, I began working full-time at NASA Glenn Research Center (GRC) in Cleveland, OH, with the materials and structures group. I analyzed and tested materials that will be used in the new Space Launch System and Orion Crew Vehicle. Mainly my research focused on the abstraction of material properties of new additively manufactured copper that will be used in rocket nozzles.

In the spring, I began my coursework at the Georgia Institute of Technology, studying to obtain my master's in aerospace engineering focusing on the structural dynamics and aeroelasticity track. I have kept my 4.0 GPA, which I have had since my undergraduate studies, while continuing to work closely with GRC and my master's thesis topic, shape memory alloys (SMAs). I have been designing a passive actuation system that utilizes SMAs unique ability to remember and get back to its 'trained' shape after either introducing heat or a magnetic field. I am designing this passive actuation for re-entry vehicles that have essential requirements needed during re-entry.

Currently, I am working with the loads and dynamics group at SpaceX in Hawthorne, CA. Specifically, I am working with the new design and qualifications of the dynamic loads of the new Dragon Crew Capsule.

In the fall, I will continue taking courses related to dynamics and materials while continuing my ongoing research relationships with NASA and SpaceX.

Kevin A. Sand, CA E '15
Matthews Fellow No. 18

I recently graduated with a master's in structural engineering from the University of California, Berkeley. During this past year, I have learned a tremendous amount about earthquake engineering, performance based design, and nonlinear static and dynamic analyses. Overall it has been an incredibly stimulating year for me.

While at Berkeley, I have taken a wide variety of courses covering many different aspects of structural engineering including structural dynamics, nonlinear structural analysis, and a plethora of design courses from some of the most respected professors in the field. I particularly enjoyed nonlinear structural analysis, structural dynamics, and seismic design of reinforced concrete structures. I have also developed incredible bonds with my classmates and professors who have all helped prepare me for a career in structural engineering.

I have now decided to leave the world of academia and enter the profession of structural engineering. I will begin my career as a design engineer with KPFF Consulting Engineers in San Francisco this August. In the years ahead, I hope to obtain my professional engineering license and eventually my structural engineering license. Additionally, my interest in blast design and protective systems grew while attending Berkeley and I hope to specialize in this field.

I am very grateful for all the support that I received from my professors, Berkeley, and the TBPI Fellowship. This support has allowed me to focus on my studies and helped provide me with the necessary skills and foundation from which to start my career. I will always be appreciative of the support I received from TBPI and look forward to giving back and mentoring future generations of engineers as I progress in my career.



Devin M. Stranford



Jonathan P. Timcheck



Megan M. Waytashek



Victoria A. Webster



Ryan T. Whelchel

Devin M. Stranford, OK B '15

Zimmerman Fellow No. 4

During the past year, I began my graduate studies at Northwestern University pursuing a Ph.D. in chemical engineering. I mainly focused on completing my coursework, which was centered on biotechnology.

My research is in mammalian synthetic biology under the direction of Joshua Leonard. Specifically, I am working on engineering extracellular vesicles as therapeutic delivery vehicles. There is increasing evidence that extracellular vesicles act as cellular communication devices in both normal physiological processes and disease progression by transporting proteins and nucleic acids between cells. Harnessing this natural transport mechanism for therapeutics holds promise for delivering a wide variety of molecules and has the potential to allow specific cell targeting.

Outside of lab, I have enjoyed being able to further my teaching experience as a teacher's assistant for the chemical engineering department. I enjoy spending time in a new city, exploring Chicago, and all the area has to offer. I look forward to becoming more involved in the community during my time at Northwestern.

I am very grateful to Tau Beta Pi for the support I received this year and am excited to continue my research and contribute to the field of engineering.

Jonathan P. Timcheck, OH Γ '15

Fife Fellow No. 206

This year, I strengthened my physics and mathematics background in the Part III Mathematics program at the University of Cambridge as a Churchill Scholar. I took interesting courses ranging from quantum computation to quantum field theory.

I also wrote a Part III mathematical essay on the verification of quantum computations, an important concern for when large quantum computers are physically realized in the future. I learned a great deal this year, and I expect the knowledge to be useful throughout the rest of my career.

I will start my Ph.D. at Stanford University in Autumn 2016 as an NSF Graduate Research Fellow, and my coursework will continue where my Part III courses left off. I will explore several research groups through Stanford's rotation program in my first year to determine exactly where my interests are strongest and my abilities are most effective. After my Ph.D., my ultimate career goal is to become a professor at a strong research university.

I would like to thank Tau Beta Pi for their generous support toward my education.

Megan M. Waytashek, SD B '15

King Fellow No. 54

Following graduation from South Dakota State University, I spent the summer at Boston Scientific in Minneapolis, MN, working in process development. In the fall, I started my master's in mechanical engineering at the University of Minnesota. Most of my time has been spent on coursework and I have enjoyed broadening my education in the engineering field.

My favorite course I've taken so far has been a new product design and business development course, which is a year-long course where you're part of a team of both engineering and business students. Your team works with a company representative to develop a product concept, a working physical prototype, and an extensive business plan. I have learned a lot about concept and detail design,

manufacturing and marketing, introduction strategy and profit forecasting, which will greatly benefit me as I start my career in industry. I will be starting another internship with Boston Scientific this summer in quality assurance, and I am looking forward to a new and exciting experience.

I would like to thank Tau Beta Pi for all of their support during my first year of graduate school. The generosity I have received has opened up numerous doors for me and I am extremely grateful. I am looking forward to continuing my education and entering the engineering industry.

Victoria A. Webster, OH A '12

Fife Fellow No. 207

During the course of my fellowship year, I have made significant strides towards the completion of my Ph.D. in mechanical engineering at Case Western Reserve University. Having completed all of my coursework, I was able to focus exclusively on my research and on available teaching opportunities. Throughout my fellowship year, I have worked extensively on developing biohybrid robots and living machines, powered by living tissue.

Over the fall semester, I served as a teaching assistant and completed experiments for my first manuscript entitled "Effect of actuating cell source on locomotion of organic living machines with electrocompacted collagen skeleton" which was published (May) in *Bioinspiration & Biomimetics*.

I have submitted a second journal article on modeling cellular contraction using finite element analysis, submitted four conference abstracts, on subjects from chicken muscle powered living machines to the use of sea slugs as a source of biomaterials, and had a full conference paper accepted at Living Machines this summer in Edinburgh. Additionally during this time, I mentored three undergraduate students who worked on all aspects of my project, from modeling to cell culture.

Next year, I will complete my Ph.D. and join the lab of Dr. Ozan Akkus at Case Western in the spring as a postdoc.

Ryan T. Whelchel, RI A '13

Fife Fellow No. 208

The past year at Purdue University has been both challenging and fulfilling in many regards. During the fall semester, I worked as a teaching assistant while looking for a professor to conduct research under. In the end my efforts were rewarded, and at the beginning of the spring semester I started work as a research assistant.

By the end of the spring, I was approached by my research advisor to change direction and start working a project that would eventually lead to a Ph.D. I am now happily pursuing a Ph.D. in structural engineering focusing on the risk assessment and mitigation of concrete box beams commonly used in bridge structures all over the United States.

Upon graduation, I hope to start consulting in structural forensics looking for solutions to our aging infrastructure while I continue learning as much as possible about structural engineering. It is my aspiration, as an engineer, to continue learning throughout my career to maintain an open mind to new and innovative solutions to the problems facing the structural engineering community.

The funding provided by this fellowship gave me the opportunity to continue my education and without it I may not have had the opportunities that I have today.



Patrick D. Homen

Patrick D. Homen, CA Y '85
Spencer Fellow No. 60

After having been an engineering educator for 18 years while teaching courses from an applied approach, Pat made the choice to complete his professorial repertoire by embarking on a pursuit for a doctoral degree in mechanical engineering at the University of California, Davis. Returning to his alma mater, he is immersed in the doctoral program working with the advanced composite research, engineering and science (ACRES) group in applied mechanics of composite materials.

Headed by Dr. Valeria La Saponara, the research aligns well with Pat's focus of teaching material science and material behavior courses at California State University, Sacramento. The focus of his research will be complemented by the work being done in the advanced composites lab at CSUS.

The first year in the program reawakened familiar and forgotten excitement and anxiety while taking required courses and preparing for preliminary exams. It was during this time, Pat realized that his many years as advisor to TBI CA Upsilon chapter proved to be invaluable. Fellow Tau Bates and friends in the TBI community were a great resource for help in reestablishing currency and competency in the required mechanical engineering coursework.

Participation in the Ph.D. program is also helping Pat to achieve a goal parallel to the doctoral degree by placing him in a pivotal position to establish a working research-applied relationship between UC Davis and CSU Sacramento. Research by the ACRES group in nondestructive testing and structural health monitoring has provided opportunities to assist in manufacturing and testing of carbon fiber reinforced polymer composites utilizing resources at both institutions.

Pat is honored to be in a rare position to orchestrate events that epitomize Tau Beta Pi's role in the engineering community. He is involved in the cutting edge of excellence and integrity in engineering, and is grateful that his acceptance into Association's Fellowship Program helped to make this possible.

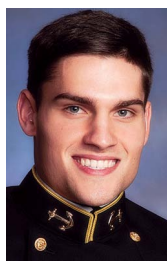
Michael K. Johnson, MD Γ '15
Centennial Fellow No. 30

After graduation from the United States Naval Academy with a bachelor's in electrical engineering, I began my studies for a master's in computer science at Stanford University focusing my time on artificial intelligence and machine learning technologies.

The coursework during the past year has been incredibly rewarding and challenging, and has given me a foundation not only in machine learning but in software and computing in general. In addition to my coursework, I have spent much of this year working on a variety of projects for my classes. For example, in continuation of a work I published while at Naval Academy, I co-authored a more recent publication that is currently under review for the IEEE Transactions on Cognitive and Developmental Systems. This work explores building an algorithm that uses electrophysiological data from the human brain to quantify the mental state of aircraft pilots using various machine learning techniques.

The hope being to use this algorithm to better understand the physiological state of aircraft pilots during flight, build improved equipment to lessen the cognitive load on these individuals, and potentially develop computer systems to know when to intervene mid-flight.

I will continue to take courses at Stanford until I am eligible to graduate in December 2016. Upon graduation, I will be attending nuclear power school in Charleston, SC in order to serve in the Navy as a nuclear submarine officer.



Michael K. Johnson



Ophelia L. Johnson

Ophelia L. Johnson, AL Γ '15
Fife Fellow No. 201

Throughout the past year as a TBI Fellow, I completed my master's degree in design and commercialization at the University of Alabama at Birmingham (UAB). I have been engaged in the research and development of multiple devices with various medical applications.

We developed low-cost scales for obese and wheel chair users for a clinical study at UAB. These scales have been designed with Bluetooth and Wi-Fi capabilities for continuous monitoring of a patient's weights by clinicians in remote locations. Along similar lines, we are developing a method for weighing recumbent patients in emergency rooms.

Working in collaboration with UABs Emergency Room and Dr. Linda Thompson, developing this device will aid clinicians in calculating the proper dose of weight-dependent medications for critical patients who are unable to stand. This may reduce the risks associated with inaccurate dosing in emergency medical cases and potentially improve patient outcomes.

The last device under development, in collaboration with Children's Hospital of Alabama and Dr. James Johnston, is an endoscopic tool with a range of applications. This tool enhances dexterity and will potentially reduce duration times of neurosurgical procedures by 25 percent. These projects are being developed in a new program at UAB, the master's of engineering in design and commercialization. Aiding to further develop the innovative structure of this program led to a publication in the ASME *Journal of Biomechanical Engineering* (Eberhardt, Johnson, et al., 2016) as well as multiple abstract submissions to the summer biomechanics, bioengineering, and biotransport conference.

David W. LaPorte, SD A '15
Anderson Fellow No. 9

Since graduating from South Dakota School of Mines & Technology, I have had the opportunity to pursue my passion of researching natural hazards that affect vulnerable communities.

After graduating, I returned to Bolivia for the summer with Engineers Without Borders to continue working on a water distribution project. Next, I returned to Guatemala as a research assistant. This work inspired me to focus on a project managing risk to landslides in precarious urban settlements.

I am working towards a master's degree in geological engineering at Colorado School of Mines (CSM) under the direction of Dr. Paul Santi. My thesis project is an evaluation of landslide risk management in Guatemala City, and I am currently conducting field work in Guatemala on a ten-month Fulbright U.S. Student Grant.

In addition, I have been collaborating with CSM's Humanitarian Engineering program, as a teaching assistant in "Engineering and Social Justice," and as a graduate mentor.

Upon graduating, I plan to work in the management of risk to natural hazards, and eventually pursue a Ph.D. The TBP Fellowship has made my graduate work possible and has inspired me to give back for the future benefit of the next generation of socially-engaged engineers.



David W. LaPorte